# SUMMARY OF ANALYSIS METHODS USED TO TEST APPLICATION OF ENVIRONMENTAL FLOW REGIMES

## BASIC TEST CASE INFORMATION

| PARAMETER | BIG SANDY RESERVOIR | ALLENS CREEK RESERVOIR |
|---|---|---|
| (1) River Basin | Sabine | Brazos |
| (2) Water Course for Reservoir | Sandy Creek | Allens Creek |
| (3) Water Course for Diversions | Sandy Creek | Brazos River |
| (4) Source of Flow Data at Project Site | Sabine WAM Run 3 | Brazos WAM Run 3 |

## ANALYSIS METHODS

| ANALYSIS ACTIVITY | METHODS FOR DETERMINING E-FLOW PASS-THROUGHS | | | | | |
|---|---|---|---|---|---|---|
| | 1 HDR-1 Spread Sheet | 2 HDR-2 Spread Sheet | 3 AECOM Spread Sheet | 4 Kennedy Monthly WAM | 5 Hoffpauir Daily WAM | 6 TWDB Spread Sheet |
| (5) Method Based on WAM Monthly Available Regulated Flows | Yes | Yes | Yes | Yes | No | Yes |
| (6) WAM Monthly Available Regulated Flows Distributed to Daily Flows | Yes | Yes | No | No | Yes | Yes |
| (7) Uses WAM Regulated Flows for Determining Daily E-Flow Pass-Throughs | Yes | Yes | No | No | Yes | Yes |
| (8) Uses WAM Regulated Flows for Determining Monthly E-Flow Pass-Throughs | No | No | Yes | Yes | No | No |
| (9) Daily E-Flow Pass-Throughs Summed to Monthly Values for Use in WAM | No | Yes | No | No | No | Yes |
| (10) Reservoir Yield Determined Based on Monthly WAM Operations | No | Yes | Yes | Yes | No | Yes |
| (11) Reservoir Yield Determined Based on Daily WAM Operations | No | No | No | No | Yes | No |
| (12) Reservoir Yield Determined Based on Daily Spreadsheet Operations | Yes | No | No | No | No | No |
| (13) Daily Senior Pass-Throughs Based on WAM Regulated - Unappropriated Flows | Yes | n/a | n/a | n/a | n/a | n/a |

## ANALYSIS RESULTS (As of 07/13/2010)

| TEST CASE AND ASSUMED E-FLOW CONDITIONS | FIRM ANNUAL YIELD (ac-ft/year) | | | | | |
|---|---|---|---|---|---|---|
| | 1 HDR Spread Sheet | 2 HDR Spread Sheet + WAM | 3 AECOM Spread Sheet + WAM | 4 Kennedy Monthly WAM | 5 Hoffpauir Daily WAM | 6 TWDB Spread Sheet + WAM |
| BIG SANDY RESERVOIR | | | | | | |
| (14) No E-Flow Requirements Engaged | 43,450 | 44,060 | 44,060 | 44,060 | | 44,060 |
| (15) Subsistence and Base Flow Requirements Engaged | 33,750 | 35,050 | 32,110 | 34,730 | | |
| (16) Subsistence, Base & Pulse Flow Requirements Engaged | 30,400 | 31,610 | 29,070 | 30,770 | | |
| (17) Subsistence, Base, Pulse and Overbank Flow Requirements Engaged | n/a | n/a | 29,070 | 30,770 | | |
| ALLENS CREEK RESERVOIR (Authorized 99,500 ac-ft/yr) | | | | | | |
| (18) No E-Flow Requirements Engaged | 106,000 | 105,960 | | 105,960 | | |
| (19) Subsistence and Base Flow Requirements Engaged | 94,700 | | | | | |
| (20) Subsistence, Base & Pulse Flow Requirements Engaged | 94,700 | | | | | |

MEETING AGENDA AND DISCUSSION TOPICS

SB-3 ENVIRONMENTAL FLOW REGIME IMPACT ANALYSES

July 6, 2010

1. BACKGROUND AND OVERVIEW

A. Meeting Purpose – To continue to discuss standardized procedures for evaluating recommended environmental flow (E-Flow) regimes and/or standards or modifications thereof as put forth by the BBESTs or BBASCs with regard to:

- Compliance with proposed frequency guidelines based on flows simulated with the TCEQ's Water Availability Models (Run 3 and Run 8) or variations of these models that incorporate Regional Planning future water supply strategies.

- Impacts on the water supply capabilities of Regional Planning future water supply strategies or other proposed water supply projects.

B. Previous Meeting Discussions

- With regard to instream E-Flow requirements, it was the general consensus that it be worthwhile and informative in the future to analyze the extent to which recommended flow frequency guidelines are satisfied based on flows simulated with WAM Run 3 and WAM Run 8 and possibly variations of these models that incorporate Regional Planning future water supply strategies (Run 9, etc.).

- With regard to instream E-Flow requirements, there was considerable discussion pertaining to alternative methods for applying environmental flow regimes (comprised of subsistence, base, high-flow pulse, and/or overbank flows) to assess their potential impacts on proposed water supply projects or strategies, particularly as to whether daily or monthly streamflows must be analyzed. It was decided that testing of specific methods would be useful to quantify impacts in terms of actual numerical values, recognizing that using the TCEQ's Water Availability Models (WAMs) or their outputs would be meaningful in order to reflect the effects of existing water rights utilization.

- Recognizing that available water supplies in many basins are limited, particularly when full utilization of existing water rights is assumed (WAM Run 3), some discussion was focused on how Stakeholders, or the TCEQ, might consider balancing the needs for environmental flows with other water demands, including satisfying future human needs. One approach would involve the following iterative steps:

  1) Operate the WAM Run 3 model with one or more proposed water supply projects or strategies incorporated with junior priority dates and subject to

specified environmental flow regimes (maybe those recommended by a BBEST), and observe the magnitude of the new water supplies generated by the proposed projects or strategies and the extent to which the resulting simulated streamflows satisfy the recommended flow frequency guidelines.

2) Assuming that the proposed water supply projects or strategies do not achieve their water supply objectives, reduce or eliminate certain aspects of the environmental flow regimes (flow magnitudes, high-flow volumes, desired flow frequencies) as specified in the WAM Run 3 model to lower the commitment of streamflows to the environment, and then rerun the model to re-evaluate the new water supplies generated by the proposed projects or strategies with the adjusted environmental flow requirements. Repeat this step iteratively until the water supply objectives of the proposed water supply projects or strategies are satisfied.

3) Incorporate the proposed water supply projects or strategies and the final environmental flow regimes as adjusted in Step 2 into the WAM Run 8 model, operate the model, and observe the magnitude of the new water supplies generated by the proposed projects or strategies and the extent to which the resulting simulated streamflows satisfy the originally recommended flow frequency guidelines.

4) Assess the ecological implications of the extent to which the resulting simulated streamflows from Step 3 deviate from the originally recommended flow frequency guidelines, if necessary make appropriate adjustments in the final environmental flow regimes from Step 2 to achieve improved ecological soundness, and rerun the WAM Run 8 model to evaluate the extent to which the resulting simulated streamflows satisfy ecological objectives.

5) Incorporate the final environmental flow regimes from Step 4 into the WAM Run 3 model, operate the model with the proposed water supply projects or strategies implemented, and verify the adequacy of the proposed projects or strategies for meeting their water supply objectives.

6) If results from Step 5 are satisfactory, then the final environmental flow regimes from Step 4 could serve as the basis for establishing environmental flow standards; if results are not satisfactory, then repeat the process starting with Step 1 using revised objectives for the proposed water supply projects or strategies and for the ecosystem.

## 2. REVIEW OF ALTERNATIVE E-FLOW APPLICATION METHODS

### A. Summary of Methods Considered

- Test Cases
- Alternative Methods

B. HDR Spreadsheet

- Overview
- Subsistence and Base Flows
- High-Flow Pulses and Overbank Flows

C. Trungale-Opdyke Modified HDR Spreadsheet

- Overview
- Subsistence and Base Flows
- High-Flow Pulses and Overbank Flows

D. AECOM Spreadsheet

- Overview
- Subsistence and Base Flows
- High-Flow Pulses and Overbank Flows

E. Kennedy Monthly WAM

- Overview
- Subsistence and Base Flows
- High-Flow Pulses and Overbank Flows

F. TWDB Spreadsheet

- Overview
- Subsistence and Base Flows
- High-Flow Pulses and Overbank Flows

3. PLAN FORWARD

A. Monthly-Versus-Daily Analyses

B. Further Testing of Methods

C. Other Topics

- Flow Regime Translation to Other Locations
- Multiple Flow Regimes for Single Project
- Junior Water Rights Subject to All Downstream Flow Regimes
- Limit on Application of B&E Freshwater Inflow Criteria to Upstream Projects

D. Summary Report